Specification for Fabricated Windbreaks

General Criteria for Livestock Fabricated Shelters for Winter Grazing

Fabricated shelters shall be located in areas where livestock protection is desired during typical storms. The site should be accessible by vehicle.

Locate the fabricated windbreak on uplands away from riparian areas and concentrated flow areas so any waste concentration will no longer impair water quality.

The shelter should be located on level, uninterrupted terrain, if possible, due to the complications on wind flow caused by hilly terrain. If the shelter must be located downwind of a hill, then place the shelter as far downwind as possible. Shelters upwind of a hill shall be placed a minimum of 75 times shelter height upwind of the base of the hill wherever possible.

Shelters may be constructed with a solid face to divert drifting snow around ends of the barrier or as porous barriers designed primarily for wind protection of the animals.

Shelters shall be 90^0 "V" shaped or semi-circular shaped, for optimum protection from wind and drifting snow. Wind speed reduction of 60-80 percent is possible in the protected area extending 5H downwind of the barrier (Figure A). The V, or closed end, should point in the direction of winter and early spring prevailing winds. The shelters cause the snow to be diverted around the shelter and deposited in drifts extending five times the shelter width (D) downwind.

Shelter width, (D) as measured across the opening between the two end posts of the shelter, must be 15H or less. A minimum length is needed to protect from eddy currents (whirlwinds) at shelter ends, however if the shelter is too long, drifting snow is forced up, over the shelter into the protected area rather than being diverted around it. Generally, the length of each wing (L) of the shelter should be 7-10 times the shelter height (H).

Design the shelter following Tables 1 and 2.

Table 1. Minimum Protected Area Needed

	Yearling cattle	Beef cows	Sheep
ft^2/animal	35	50	10-15

Table 2. Protected Area at Maximum Wing Length (See Figure A)

Barrier height, ft.	Wing L, ft.	Width D, ft.	Protected area, ft^2
6	60	84.8	3,964
8	80	113.1	7,047
10	105	148.5	11,823
12	125	176.8	16,828

Semi-circular shaped shelters can be built with approximately the same quantity of materials as the "V" design. Dimensions for the semi-circular shaped barriers should be based on a radius equal to one-half D for the "V" shaped barriers as shown in Table 2. Semi-circular shelters are generally the most

economical (material cost per protected square foot); however, the type of material used for board or panels can be a limiting factor due to the shape.

General Structural Criteria for Fabricated Windbreaks

Panel covering shall be minimum nominal 1-inch lumber, 28-gauge coated corrugated steel or similar durability material. Boards or panels should be attached to the windward side of the shelter. Provide rub rails or other features as needed to protect the structure from animal damage.

Wood installed within eight inches of the ground must be pressure treated (or equal). Where a fabricated shelter is to be constructed of wood on a permanent location, sizes and spacing shown in Table 3 may be used.

Table 3. Post Spacing for Fabricated Windbreaks (Minimum 6" Dia Tops)

Barrier Height Feet	Pole Length Feet	Min. Depth Feet	Pole Spacing Feet	Girt Number & Size
6	8	3.5	10	3, 2x8
8	10	3.5	10	4, 2x8
10	12	4	8	5, 2x6
12	14	4	6	6, 2x4

Criteria for Fence (Straight Line) Shelters for Feedlots.

Fabricated windbreak protection for open feedlots is usually straight line windbreak fences. These windbreaks are not as effective as the "V" shaped design since less protection is provided if wind direction varies from anything perpendicular to the fence. Snow is forced over the fence and deposited downwind of the structure rather than diverted around it. Fence shelters may be designed either as solid barriers or as porous (open) fences. Use ND Conservation Job Sheets 26 & 27 for design documentation and checkout.

Solid fences are typically located adjacent to the lot to be protected along the lot perimeter since snow accumulation does not usually extend out far from the fence. Wind protection is good in the area next to the fence. Wind drops the snow upwind of the fence a distance of 1 fence height (1H) and downwind of the fence 5H. The wind protection area extends 15H downwind of the fence (10H below the snow drop zone). See Figure C.

Porous or open fences are more effective at controlling wind than solid fences and drop more snow. The porous fences are usually located upwind of the lot far enough to keep the area to be protected out of the snow drop zone. The major snow drop zone is of shallower depth than a solid fence but extends downwind a greater distance (10H) from the barrier. The wind protection area extends 20H downwind of the fence (10H below the snow drop zone). See Figure D.

Porous barriers must have approximately 80 percent solid and 20 percent open surface area (Figure B). The openings may run vertically or horizontally. Porous barriers must be mounted approximately 12 inches above the ground to reduce eddy currents (whirlwinds) and allow wind to keep sweeping the snow downwind of the fence.

Criteria for Portable Shelters

The panel coverings shall be solid or up to 20% porous in accordance with the requirements for straight line shelters. Use ND Conservation Job Sheet 25 for design documentation and checkout.

Livestock wintering locations will be moved annually as a minimum.

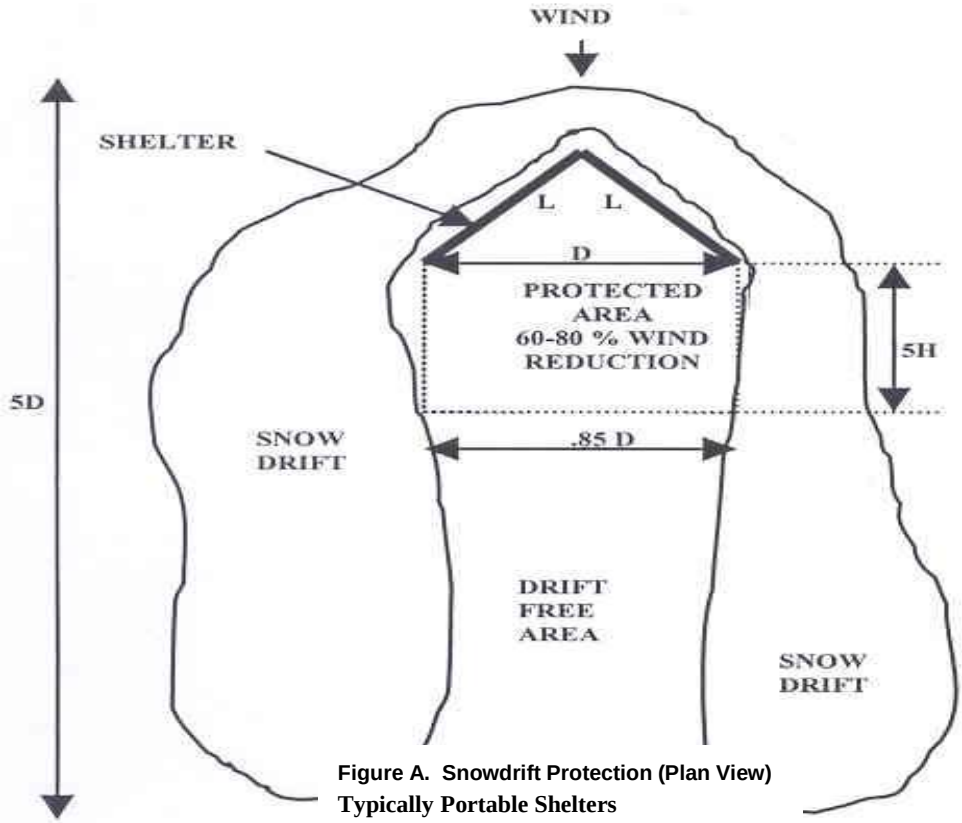

Figure A. Snowdrift Protection (Plan View)
Typically Portable Shelters

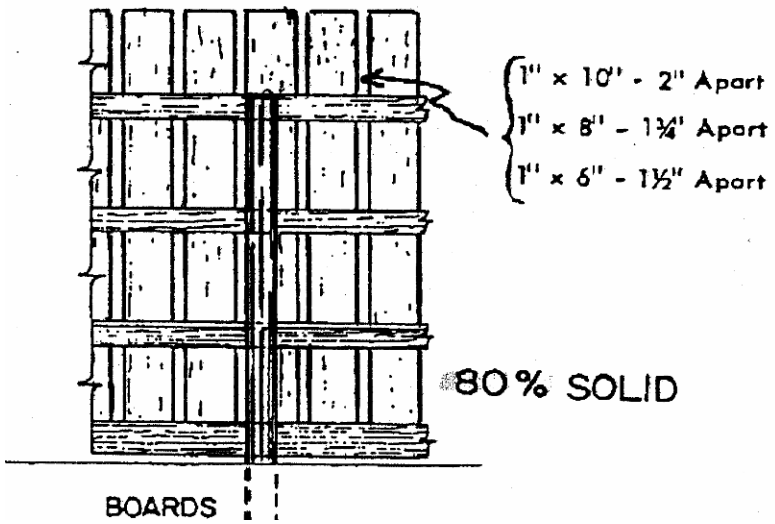

Figure B. 20 Percent Porous – 80 Percent Solid Structure

Straight Line - Permanent Installations

(Figures C & D)

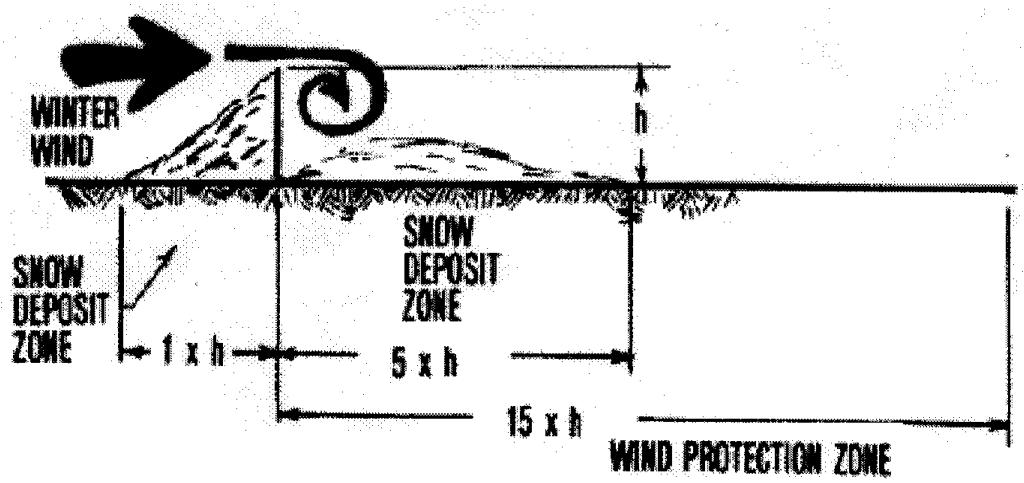

Figure C. Protection zone for a solid windbreak fence.

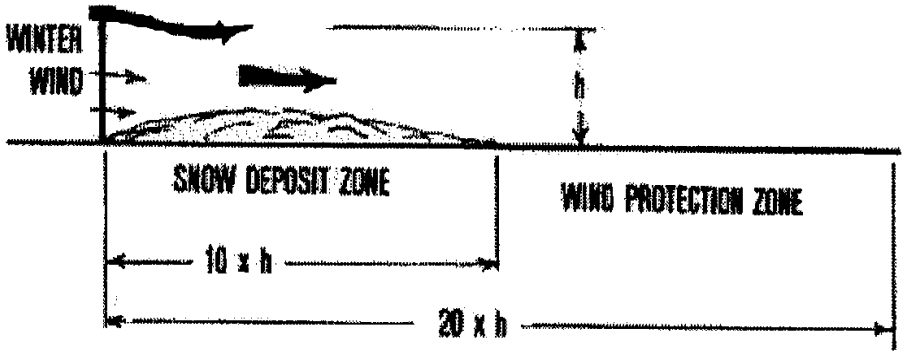

Figure D Protection zone for a porous windbreak fence.